What is claimed is:

[Claim 1] A vehicle crash safety system for a host vehicle comprising:

a pre-crash sensing system generating host vehicle dynamics data, a target vehicle threat assessment, and target vehicle bumper or doorsill location data;
a Dynamic State Self-Tuning (DSST) controller in electronic communication with said pre-crash sensing system, said DSST controller generating a reference ride-height signal as a function of said host vehicle dynamics data, target vehicle threat assessment, and target vehicle bumper or doorsill location data;
a Rule-Based Height Regulator (RBHR) controller in operative communication with said DSST controller and an adjustable suspension system, said RBHR controller programmed to adjust the host vehicle suspension height by said suspension system, in response to said reference ride-height signal and measured host vehicle suspension height, when said target vehicle threat assessment indicates an imminent crash event.

[Claim 2] A system as recited in claim 1 wherein said DSST controller sets said reference ride-height signal and said RBHR controller continuously adjusts said vehicle suspension height until approximately 40 ms prior to an impact event.

[Claim 3] A system as recited in claim 1 wherein said adjustable suspension system comprises an air suspension system having at least one electronically controlled air valve.

[Claim 4] A system as recited in claim 3 wherein said RBHR controller outputs a desired valve output position.

[Claim 5] A system as recited in claim 4 wherein said RBHR controller modifies both an air inflow value and an air outflow value for said at least one air valve.

[Claim 6] A system as recited in claim 1 wherein said RBHR controller output modifies said host vehicle suspension height as a function of a height-error signal related to said target and host vehicle ride-heights, and said RBHR incorporates a multi-variable rule-based strategy for vehicle suspension height adjustment.

[Claim 7] A system as recited in claim 1 wherein said DSST controller and said RBHR controller comprise a centralized ride-height controller architecture separate from said adjustable suspension system.

[Claim 8] A system as recited in claim 1 wherein said pre-crash sensing system comprises at least one of a vision system, radar system, lidar system, or transponder/receiver system.

[Claim 9] A system as recited in claim 1 wherein said target vehicle threat assessment data includes target range, closing velocity, approach angle and target vehicle type.

[Claim 10] A system as recited in claim 1 wherein said vehicle dynamics data includes vehicle speed, yaw rate, steering wheel angle and bumper height.

[Claim 11] A system as recited in claim 8 wherein said pre-crash sensing system comprises a sensor fusion stage producing said target vehicle threat assessment as a weighted output of signals from at least two of said vision system, radar system, lidar system, or transponder/receiver system.

[Claim 12] A method for operating a safety system for a host vehicle comprising:

generating host vehicle dynamics data, a target vehicle threat assessment, and target vehicle bumper or doorsill location data from a pre-crash sensing system;
generating a reference ride-height signal as a function of said host vehicle dynamics data, target vehicle threat assessment, and target vehicle bumper or doorsill location data;
communicating said reference ride-height signal to a RBHR controller, said RBHR controller sending suspension height modification signals to an adjustable suspension system of said host vehicle, said suspension system adapted to operate said host vehicle ride-height as a function of said suspension height modification signals; and
in response to an imminent crash event, modifying said suspension height as a function of said target vehicle bumper or doorsill location data.

[Claim 13] A method as recited in claim 12 wherein said adjustable suspension system comprises an air suspension system having at least one electronically controlled air valve, and wherein the step of modifying includes continuously modifying said air valve position with respect to real-time target vehicle bumper or doorsill location data.

[Claim 14] A method as recited in claim 13 comprising determining said host vehicle ride-height and wherein the step of modifying includes adjusting an air valve outflow value or air valve inflow value as a function of a host and target vehicle height difference or error signal, and the change in height-error signal.

[Claim 15] A method as recited in claim 13 wherein said air valve position is continuously modified until approximately 40 ms prior to an impact event.

[Claim 16] A method as recited in claim 12 wherein said pre-crash sensing system comprises at least one of a vision system, radar system, lidar system, or transponder/receiver system.

[Claim 17] A method as recited in claim 16 wherein said target vehicle threat assessment comprises a weighted output of signals from at least two of said vision system, radar system, lidar system, or transponder/receiver system.

[Claim 18] A vehicle crash safety system for a host vehicle comprising:

a pre-crash sensing system generating host vehicle dynamics data, a target vehicle threat assessment, and target vehicle bumper or doorsill location data;

a Dynamic State Self-Tuning (DSST) controller in electronic communication with said pre-crash sensing system, said DSST controller generating a reference ride-height signal as a function of said host vehicle dynamics data, target vehicle threat assessment, and target vehicle bumper or doorsill location data;
a host vehicle ride-height sensor providing a measured ride-height signal;
a Rule-Based Height Regulator (RBHR) controller in feedback communication with an adjustable suspension system and said ride-height sensor, said RBHR controller programmed to adjust the host vehicle suspension height l as a function of an error signal representing a difference between said measured ride-height signal and said target vehicle bumper or doorsill location data when said target vehicle threat assessment indicates an imminent crash event; and
said adjustable suspension system in operative communication with said RBHR controller and adapted to adjust said host vehicle suspension height in response to signals from the RBHR.

[Claim 19] A system as recited in claim 18 wherein said adjustable suspension system comprises an air suspension system having at least one electronically controlled air valve.

[Claim 20] A system as recited in claim 18 wherein said pre-crash sensing system comprises at least one of a vision system, radar system, lidar system, or transponder/receiver system.